

Optically resolving size and composition distributions of particles from the volume scattering functions

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Particles in the ocean vary significantly in their size and compositions, ranging from molecules to aggregates of several millimeters, from organic to minerals and from animate to non-living. Many physical and biogeochemical processes in the ocean vary with the size and composition of particles. However, most of field measurements can only resolve particles of sizes typically $> 1 \mu\text{m}$, little is known about the size distribution of submicron particles. In addition, little is known about the in situ composition of particles. Significant technological and theoretical advances have taken place over the last decade or so in the field of light scattering, which allow us to (1) measure the detailed angular scattering in situ; (2) drop the idealized and unrealistic, yet frequently used, assumption of spherical particles; and (3) interpret this angular scattering measurement in terms of, and retrieve, the size distribution and composition of particles of sizes $0.02\text{--}200 \mu\text{m}$ [1,2]. The results have been validated in several studies with independent measurements of acoustically determined size distribution of bubbles, LISST-based estimates of particle size distribution, and laboratory gravimetric determinations of the mass for particulate organic and inorganic matter [3,4]. In this presentation, we will summarize these results, particularly towards improving the estimate of carbon flux using the particle size and density distributions retrieved from the in situ measurements of volume scattering functions.

References

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